

NEW SPECIES OF *ATOPSYCHE* FROM COSTA RICA (TRICHOPTERA: HYDROBIOSIDAE)¹

Roger J. Blahnik², Robert M. Gottschalk³

ABSTRACT: Three new species in the caddisfly genus (Trichoptera: Hydrobiosidae) from Costa Rica are described and illustrated: *A. jaba*, *A. minimajada*, and *A. tapanti*. Eleven additional species are known from the country. Illustrations of male genitalia and wing venation are provided for the new species. A correction is made in the distribution of *A. trifida*, mistakenly reported by Schmid (1989) to occur in Costa Rica.

RESUMEN: Tres nuevas especies de (Trichoptera: Hydrobiosidae) de Costa Rica son descritas e ilustradas: *A. jaba*, *A. minimajada* y *A. tapanti*. Ilustraciones de la venación de las alas y de los genitales de los machos de estas nuevas especies son incluidas. Once especies más son reportadas para el país. Finalmente, se presenta una corrección a la distribución de *A. trifida*, erróneamente registrada por Schmid (1989) en Costa Rica.

The caddisfly genus *Atopsyche* is very species diverse and predominantly Neotropical in distribution, ranging from northern Argentina to Texas and Arizona (Ross and King 1952). Larvae are typically found in cool streams and are free-living and predacious, characterized by unusual chelate front legs, undoubtedly adapted for securing prey (Wiggins 1996). Larval morphology is illustrated by Wiggins (1996). The genus was first revised by Ross and King (1952) when less than 30 species were known. Biogeographical and evolutionary relationships of the species were also discussed by Ross and King and expanded on by Ross (1953), who also described several additional species. Their biogeographical conclusions require reassessment in light of more recent developments in the field. Schmid (1989) presented a complete treatment of the family Hydrobiosidae, including a review of the genus and also described many new species. He criticized the phylogenetic framework erected by Ross and King, but chose to retain it because a phylogenetic analysis of the genus was outside the scope of his work. A comprehensive phylogenetic analysis of the genus is needed before relationships between species can be stated with confidence. Although the diversity in the genus is much better understood than when Ross and King did their revision, additional species continue to be described and undoubtedly many more remain to be discovered. Schmid (1989) commented that a more thorough knowledge of the genus may be necessary

¹ Received August 29, 1996. Accepted October 19, 1996.

² University of Minnesota, Department of Entomology, 219 Hodson Hall, 1980 Folwell Avenue, St. Paul, Minnesota 55108-6125 USA.

³ Louisiana State University, Department of Plant Biology, 502 Life Sciences Building, Baton Rouge, Louisiana 70803-1705 USA.



for a meaningful phylogenetic treatment. Descriptions of new species contribute to that base of knowledge and therefore serve as an important prelude to a new phylogenetic analysis of the genus. Since the treatment of the genus by Schmid, additional new species from Ecuador were described by Sykora (1991) and a new species from Haiti by Botosaneanu (1991). With the inclusion of the three species described here, 116 species have been described to date. The species descriptions presented here represent part of an ongoing research project by Ralph W. Holzenthal, University of Minnesota, and his colleagues to fully document and describe the caddisfly fauna of Costa Rica.

Including the three new species described below, 14 species are now known to occur in Costa Rica. The 11 previously described Costa Rican species are: *A. callosa* (Navás, 1924), *A. chimpuoclo* Schmid 1989, *A. cira* (Mosely, 1949), *A. dampfi* Ross and King 1952, *A. erigia* Ross 1947, *A. huainacapac* Schmid 1989, *A. implexa* (Navás, 1924), *A. majada* Ross 1947, *A. pachacamac* Schmid 1989, *A. paucartampu* Schmid 1989, and *A. talamanca* Flint 1974. Species of *Atopsyche* in Costa Rica have been collected between 30 m and 3120 m above sea level. However, most of the Costa Rican species were collected at middle elevations between 1400 m and 1650 m.

Schmid (1989) listed *A. trifida* Denning as occurring in Costa Rica, probably as a *lapsus*. The holotype locality was given as Puerto Rico by Denning (1948). Despite intensive collecting by Holzenthal, *A. trifida* has not been found in Costa Rica, and we have concluded that this species does not occur in Costa Rica.

Terminology used to describe the male genitalia follows Schmid (1989). A summary of genitalic terminology can be found in Fig. 1. Holotypes for the three species are deposited in the collection at the National Museum of Natural History [NMNH], Smithsonian Institution, Washington DC. Paratypes for *A. jaba* and *A. minimajada* are deposited in the University of Minnesota Insect Collection, St. Paul, Minnesota [UMSP], and at Costa Rica's National Biodiversity Institute [INBIO], as stated in the species descriptions. Unless otherwise stated, all specimens are represented by pinned material.

DESCRIPTION OF NEW SPECIES

Atopsyche jaba, NEW SPECIES

Figs. 1A-D, 4A-B, 7

Atopsyche jaba most closely resembles *A. boneti* Ross and King (1952), *A. cordoba* Denning (1968), and *A. dampfi* Ross and King (1952), especially in the armature of the parapods. However, the new species can be distinguished from the others by the shape of the first article of the inferior appendage, which is narrower, projects dorsally, and lacks any trace of an apicoventral projection. There are also differences in the structure of the apical appendages of the

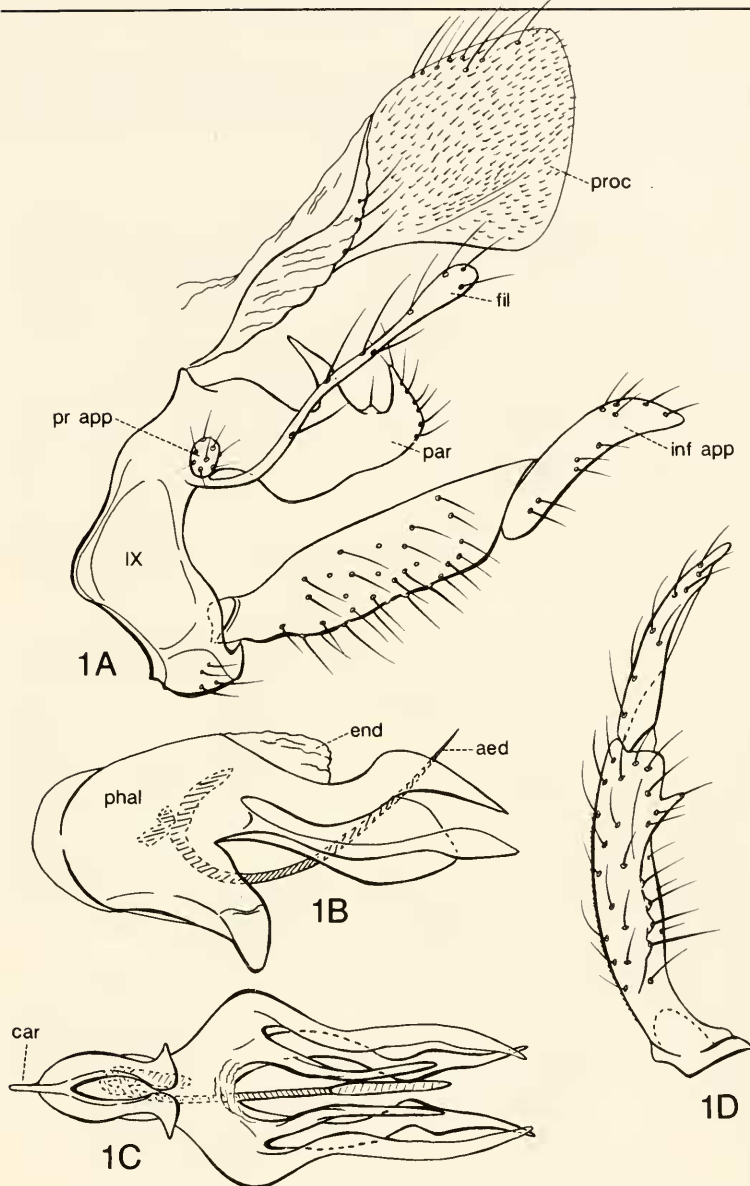


Fig. 1. *Atopsyche jaba* n. sp., male genitalia: A, segments IX, X, and proctiger, lateral; B, phallic apparatus, lateral; C, phallic apparatus, ventral; D, inferior appendage, ventral. **Terminology:** IX = segment IX, proc = proctiger, par = parapod, fil = filipod, pr app = preanal appendage, inf app = inferior appendage, phal = phallosome, end = endotheca, aed = aedeagus, car = anterior carina of phallosome.

phallosome. Unlike *A. cordoba* and *A. dampfi*, *A. jaba* lacks distinctive black scales associated with a thickened base of Cu2 on the hindwing, but like those species has elongate, curled setae emerging from the first anal cell of the hindwing (Fig. 4B).

ADULT: Forewing length 5.5-6.0 mm (male). Overall body color yellowish brown to light brown; antennae fuscous, yellowish basally; setae of palps fuscous. Wings light brown, erect setae of veins forming mottled pattern of alternate dark brown and amber colored setae, apex of wing fringed with light brown setae at apices of veins and dark brown setae between. Forewing venation (Fig. 4A) complete; R₁ apparently unbranched, apically bordered by dense brown setae in region of pterostigma; fork I near apex of wing, fork II sessile; stem of M distinctly curved between m-cu crossvein and first fork of M; Cu₂ converging near fused anal veins (1A + 2A + 3A), with crossvein near apex forming small cell on posterior margin of wing (Fig. 4A). Hindwing with R₁ incomplete, forked apically to Sc and stem of R₂ + R₃; forks II and IV absent; anal veins very strongly arched toward anal margin; male with first anal cell possessing elongate setae (Fig. 4B). Nygmata apparently absent from both wings. Terga III and IV of male (Fig. 7) each with pair of prominent, concavely rounded glands, lined internally with numerous short setae, located at anterolateral margins of respective terga. Sternum V of male with pair of small, convexly rounded glands, located at anterolateral margin of sclerite. Sterna VI and VII of male each with prominent spinelike ventral process on posteromesal margin; process on VII nearly straight, process on VI longer and curved posteriad, with row of short setae along anterior margin and terminating with large, blunt, spinelike seta.

Male genitalia: Segment IX, in lateral view, narrow (Fig. 1A). Parapod with two prominent spines on dorsal edge, both slightly curved anteriorly, the posterior spine smaller than anterior spine (Fig. 1A). Filipod long, slender, sparsely covered with elongate setae. Preanal appendage small, irregularly rounded, setose. Proctiger, in lateral view, broadly widened apically, covered externally with numerous minute setae; apicodorsal and lateral margins with elongate, coarse setae, sparse on lateral margin. Inferior appendage with first article constricted basally, otherwise relatively narrow and of uniform width, slightly curved mesad, angularly projecting apicodorsally, mesal surface with small preapical appendage; second article obliquely joined to first, slightly tapering and curved at apex. Phallosome (Figs. 1B and 1C) with keel-like carina at anterior end; ventrally with short curved process articulating with inferior appendages; apex deeply divided mesally, forming paired lobes, each rather broadly rounded at apex and associated externally with pair of elongate, narrow dorsal and ventral processes, dorsal ones distinctly sinuous, with apices acute and curved ventrad. Aedeagus an elongate, stout, spine-like structure, with distinct curvature.

Type material: *Holotype:* ♂, COSTA RICA: Puntarenas: Río Jaba at rock quarry, 1.4 km (air) W Las Cruces, 8.79°N, 82.97°W, 15.iii.1991, 1150 m, Holzenthal, Muñoz, Huisman (NMNH). *Paratypes:* COSTA RICA: same location as holotype, 9.viii.1990, 2 ♂ (UMSP), 1 ♂ (INBIO).

Etymology: Named for the Jaba River, near the Wilson Botanical Garden, Las Cruces, Costa Rica.

Atopsyche minimajada, NEW SPECIES

Figs. 2A-D, 5A-B, 8A-B

The wing and body color pattern and structure of the male genitalia of *Atopsyche minimajada* are very similar to *Atopsyche majada* Ross (1947). Specimens of the two species were initially confused by us. However, male genitalia of the two species have several characters which readily serve to separate them. *Atopsyche minimajada*, can be distinguished from *A. majada* by having the apicoventral lobe of the first article of the inferior appendage subequal

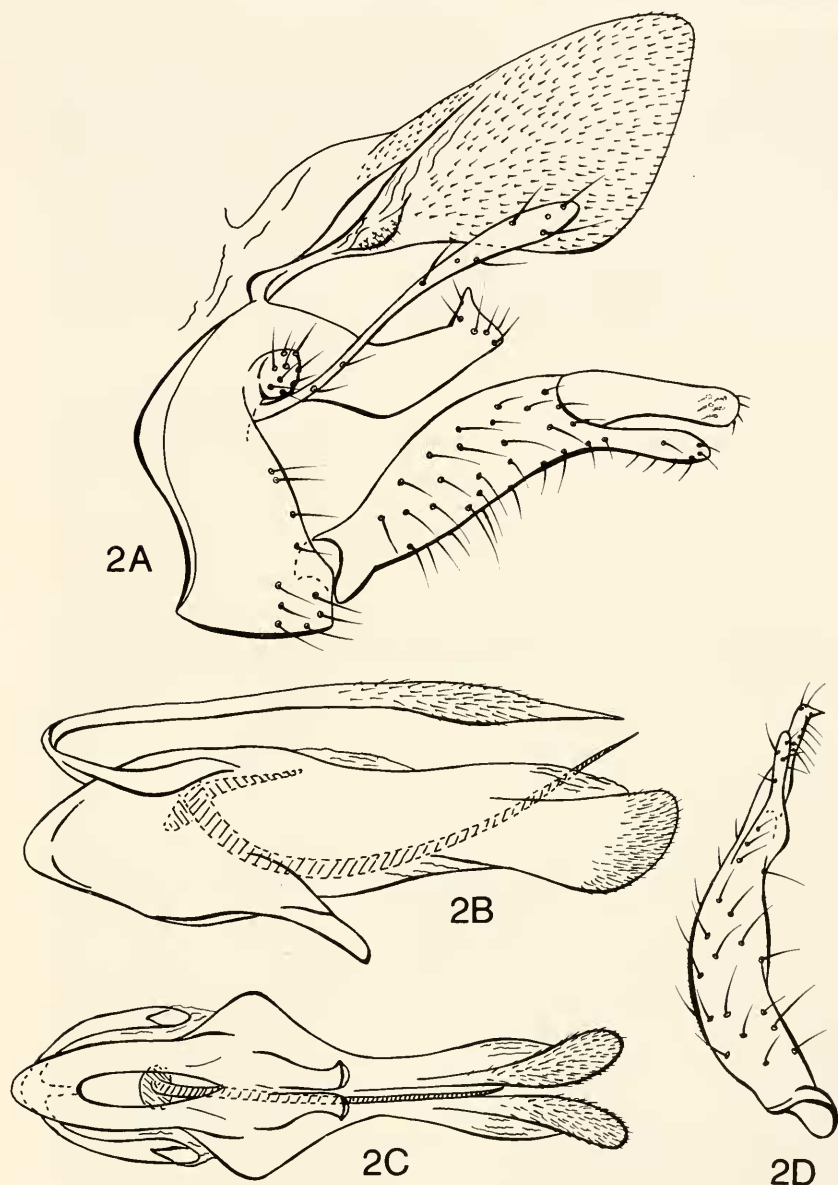


Fig. 2. *Atopsyche minimajada* n. sp., male genitalia: A, segments IX, X, and proctiger, lateral; B, phallic apparatus, lateral; C, phallic apparatus, ventral; D, inferior appendage, ventral.

in length to the second article, as opposed to being distinctly shorter in *A. majada*, and also by the shape of the parapods, which in *A. minimajada* have more prominent apices and are less constricted preapically (Fig. 2A). Additionally, the elongate, recurved dorsal spine, associated with the base of the phallosome in both species is differently formed; in *A. minimajada* the spine widens preapically and possesses numerous minute setae (Fig. 2B), whereas in *A. majada* the spine is narrow throughout its length and lacks any associated setae. The name for the new species derives from the fact that specimens we examined are smaller on average than those of *A. majada*. The size of *A. minimajada*, however, falls within the range of variability for *A. majada* and size alone is not sufficient to distinguish the two species.

ADULT: Forewing length 5.1-5.5 mm (male), 5.8-6.7 mm. (female). Head, body, and legs pale yellow to light brown, except terga of abdomen fuscous. Setae of head whitish. Palps pale yellow with fuscous setae; antennae yellowish at base, fuscous apically. Wings light brown, with dark brown setae along costal margin, dense in region of pterostigma, and with patch of dark brown along anal margin at midlength; veins with erect setae, alternating in short segments between whitish and dark brown. Forewing venation complete (Fig. 5A); R_1 apparently unbranched apically, bordered by dense brown setae in region of pterostigma; fork I near apex of wing, fork II sessile; stem of M distinctly curved between m-cu and first fork of M; Cu_2 converging near fused anal veins ($1A + 2A + 3A$), with crossvein near apex forming small cell on posterior margin of wing. Hindwing (Fig. 5B) with R_1 incomplete, forked apically to Sc and stem of $R_2 + R_3$; forks II and IV absent. Male with Cu_2 possessing elongate, thickened region in proximal part of vein; anal veins very strongly arched toward anal margin, base of 2A with brush of elongate setae extending over thickening of Cu_2 . Forewing with nygma near base of fork II, nygma apparently absent from hindwing. Tergum III of male (Fig. 8A) with pair of concavely rounded glands laterally on anteroventral margin. Sternum V of male (Fig. 8B) with pair of short, projecting, saccate glands laterally on anterodorsal margin. Sterna VI and VII of male each with prominent spinelike ventral process on posteromesal margin; process on VII nearly straight, process on VI longer and curved posteriad, with row of short setae along anterior margin and terminating with large, blunt, spinelike seta.

Male genitalia: Segment IX, in lateral view, relatively narrow. Parapod nearly parallel sided, moderately inflected at middle, apicodorsally with subtriangular, spinelike process (more prominent than in *A. majada*). Preanal appendage small, rounded, with few setae. Filipod elongate, narrow, gradually widened apically, sparsely clothed with elongate setae. Proctiger, as viewed laterally, broadly widened apically, covered externally with numerous minute setae; dorsal, lateral and apical margins without elongate setae. Inferior appendage, as viewed laterally, with first article moderately wide, slightly bulging at middle; posteriorly, with narrow, projecting, apicoventral lobe, nearly equaling second article in length; in ventral view (Fig. 2D), with mesal curvature; second article narrow, emerging from apicodorsal margin of first article, narrowly separated from ventral lobe of first article and only slightly wider and longer. Phallic apparatus relatively simple, similar to *A. majada* (Figs. 2B, 2C); apex divided mesally; in lateral view, apical lobes slightly projecting ventrad and with numerous minute setae; phallosome with elongate, recurved basal spine, branched at base and membranously attached to phallosome, widening preapically and covered with numerous minute setae; aedeagus forming elongate curved spine with basal enlargement.

Type Material: *Holotype:* ♂, COSTA RICA: Guanacaste: Estación Pitilla, Río Orosi, 10.931°N' 85.428°W, 700 m, 22-25.v.1990, Holzenthal and Blahnik (NMNH).

Paratypes: COSTA RICA: Alajuela: Cerro Campana, Río Bochinche trib., 6 km (air) NW Dos Ríos, 10.945°N, 85.413°W, 600 m, 22-23.vii.1987, Holzenthal, Morse, Clausen, 1 ♂ (UMSP); Río Pizote, ca. 5 km (air) S Brasília, 10.972°N, 85.345°W, 390 m, 12.iii.1986, Holzenthal and

Fasth, 4 ♂, 14 ♀ (pinned), 12 ♂ (in alcohol) (UMSP); Río Pizote, ca. 5 km N Dos Ríos, 10.948°N, 85.291°W, 470 m, 9.iii.1986, Holzenthal and Fasth, 1 ♂ (in alcohol) (UMSP); Guanacaste: Parque Nacional Guanacaste, El Hacha, Quebrada Pedregal, 10.983°N, 85.539°W, 300 m, 27.vii.1987, Holzenthal, Morse, Clausen, 1 ♂ (UMSP); Parque Nacional Guanacaste, Estación Maritza, Río Tempiquito, 10.958°N, 85.497°W, 550 m, 30-31.vii.1990, Huisman, Błahnik, Quesada, 1 ♂ (in alcohol) (INBIO); Río Gongora (sulfur mine), 4 km (air) NE Quebrada Grande, 10.887°N, 85.470°W, 590 m, 21.vii.1987, Holzenthal, Morse, Clausen, 1 ♂ (UMSP); Río Los Ahogados, 11.3 km ENE Quebrada Grande, 10.865°N, 85.423°W, 470 m, 7.iii.1986, Holzenthal and Fasth, 4 ♂, 5 ♀ (in alcohol) (UMSP); Heredia: Río Bijagual on road to Magsasay, 10.408°N, 84.076°W, 140 m, Holzenthal, Morse, Fasth, 1 ♂, 1 ♀ (UMSP); Río Sarapiquí, 7 km W Puerto Viejo, 10.452°N, 84.067°W, 50 m 11.ii.1986 Morse and Fasth, 5 ♂ (in alcohol) (UMSP); Puntarenas: Río Ceibo, route 2, ca. 6 km W road to Buenos Aires, 9.149°N, 83.377°W, 250 m, 20.ii.1986, Holzenthal, Morse, Fasth, 2 ♂, 6 ♀ (pinned), 6 ♂, 115 ♀ (in alcohol) (UMSP); San José: Res. Biol. Carara, Río del Sur, 1.5 km (rd) S of Carara, 9.769°N, 84.531°W, 160 m, 13.iii.1991, Holzenthal, Muñoz, Huisman, 1 ♂ (UMSP).

Etymology: Named because of the relatively small size of specimens of this species when compared to those *A. majada*, and because it was the size of the specimens that first drew our attention to differences between the species.

Atopsyche tapanti, NEW SPECIES

Fig. 3A-D

This species is most similar to *Atopsyche paucartampu* Schmid (1989), but can be distinguished by several subtle differences. The inferior appendage of *A. tapanti*, in ventral view, has the first article less sinuously bulging at the middle and the second article is much narrower than in *A. paucartampu*. Additionally, the filipods and parapods of *A. tapanti* are shorter.

ADULT: Forewing length 7.4 mm (male). Overall body color yellowish brown, slightly darker dorsally, terga of abdomen fuscous; palps yellowish, with scant brownish setae; antennae yellowish basally, brown apically. Overall color of wings brownish; erect setae of veins mostly black or blackish with interspersed segments of pale yellow setae. Forewing venation complete (Fig. 6A); R₁ branched apically, covered with dense brown setae in region of pterostigma; fork I near apex of wing, fork II sessile; Cu₂ converging near fused anal veins (1A + 2A + 3A), with crossvein near apex forming small cell on posterior margin of wing. Hindwing (Fig. 6B) with R₁ incomplete, fork at apex intersecting Sc and stem of R₂ + R₃; forks II and IV absent; anal veins distinctly arched toward anal margin; anal margin of wing, 2A (sparsely), and base of anal veins with elongate setae. Nygmata apparently absent from both wings. Tergum III of male with pair of concavely rounded glands on anterolateral margin (as in Fig. 8A). Sternum V of male with pair of elongate, projecting glands on anterolateral margin (Fig. 9). Sterna VI and VII of male each with prominent spinelike ventral process on posteromesal margin, nearly equal in size and shape, process on VI without stout apical seta;

Male genitalia: Segment IX, in lateral view (Fig. 3A), relatively wide basally, anterior margin broadly rounded. Parapod short, apex rounded, with one small, blunt tooth on posterodorsal margin. Filipod very short, fingerlike. Preanal appendage small, rounded, setose. Proctiger, as viewed laterally, broadly widened apically, covered externally with numerous minute setae; lateral margin with several elongate setae, apex without setae. Inferior appendage, in lateral view, with first article broadly, evenly widened at middle, second article wide basally, apically narrow and mesally curved; in ventral view, first article mesally curved, with conspicuous, setose, thumblike projection near base on mesal surface, second article narrowed and slightly hooked apically. Phallic apparatus (Fig. 3B) simple, mesally bifurcated, forming paired apical lobes,

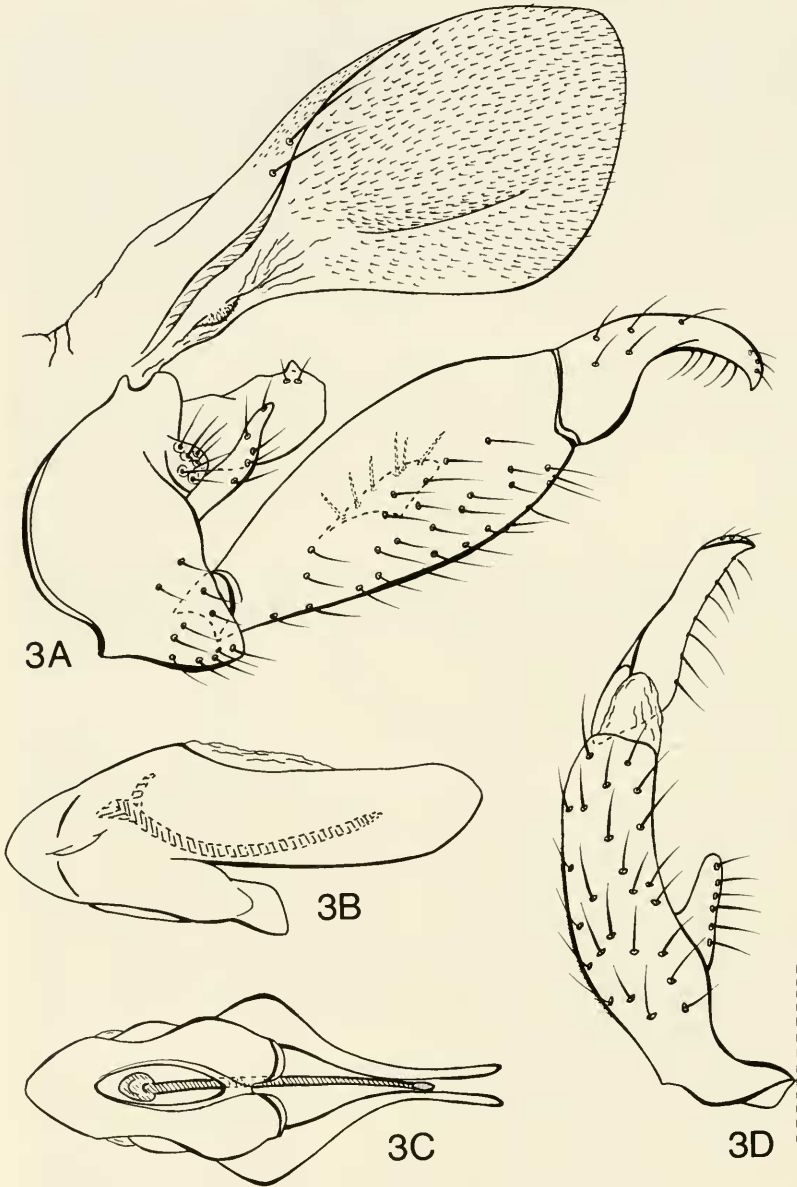
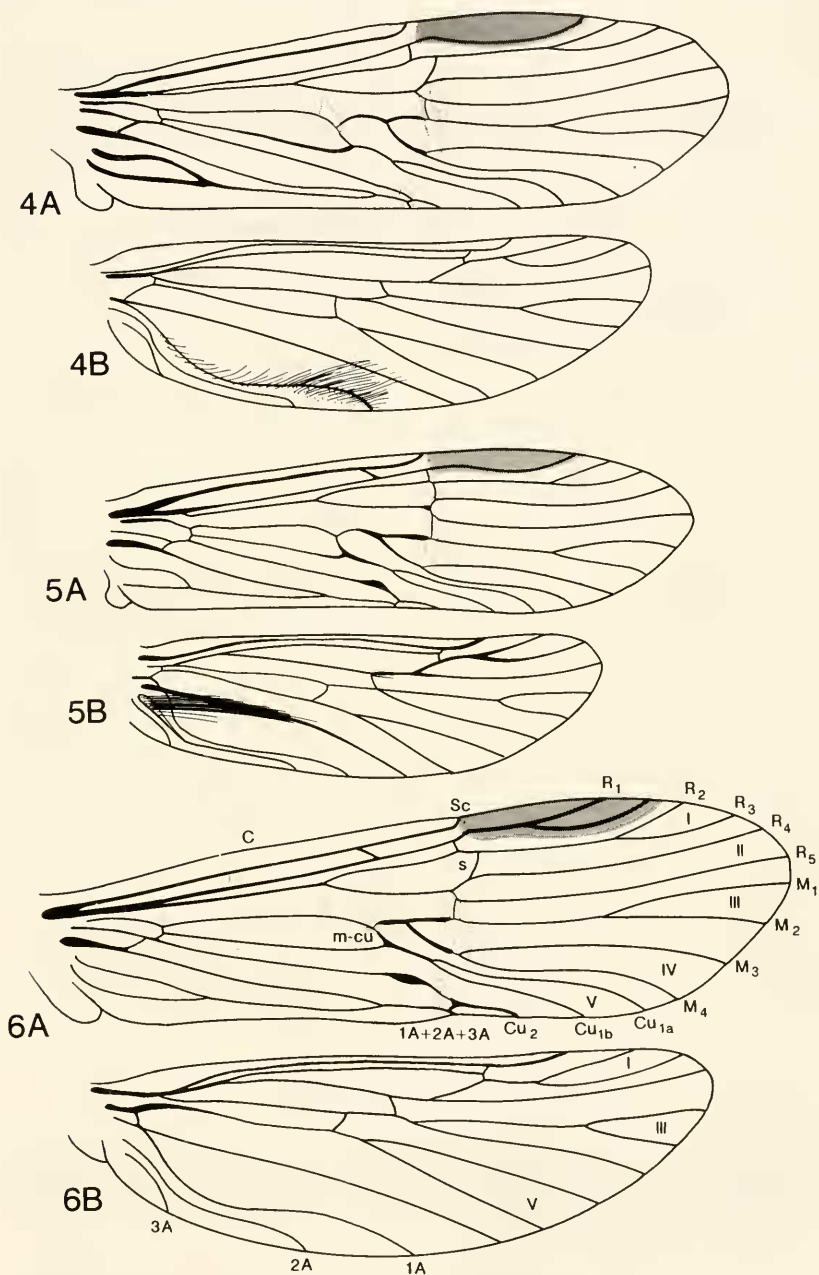
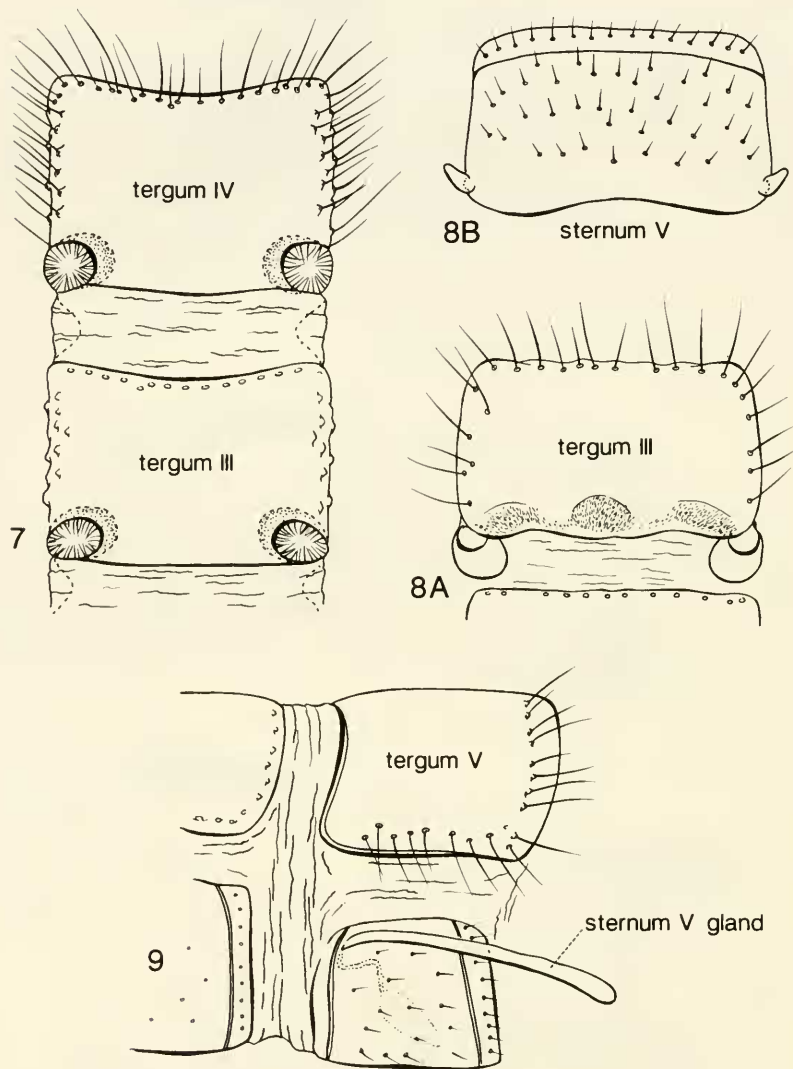


Fig. 3. *Atopsyche tapanti* n. sp., male genitalia: A, segments IX, X, and proctiger, lateral; B, phallic apparatus, lateral; C, phallic apparatus, ventral; D, inferior appendage, ventral.



Figs. 4-6. *Atopsyche* n. spp., wings: A, forewing; B hindwing. 4. *A. jaba*; 5. *A. minimajada*; 6. *A. tapanti*.



Figs. 7-9 *Atopsyche* n. spp., abdominal glands. 7. *A. jaba*, dorsal view of terga III and IV and associated glands; 8. *A. minimajada*, A, dorsal view of tergum III and associated glands, B, ventral view of sternum V and associated glands; 9. *A. tapanti*, new species, lateral view of segment V and associated gland.

broadly rounded at apex, as viewed laterally. Aedeagus a stout, dorsally curved spine with basal enlargement.

Type Material: *Holotype*: Male, COSTA RICA: Cartago: Reserva Tapantí, Río Grande de Orosi, 9.686 N., 83.756 W, 1650m, 8-9.vii. 1986, Holzenthal, Heyn, Armitage (NMNH).

Etymology: Referring to the type locality, Tapantí, National Park, Costa Rica.

RELATIONSHIPS OF THE COSTA RICAN SPECIES

A foundation for the phylogenetic placement of species of *Atopsyche* was erected by Ross and King (1952) and Ross (1953), who used character similarities to define a number of species groups, all of which were placed into two subgenera, *Atopsyche* and *Atopsaura*. Schmid (1989) placed his newly described species, and also those described subsequently to Ross (1953), within the framework erected by Ross and King, based on the characters they used. However, as discussed in the introduction, Schmid noted that these were probably not natural groupings. He also reduced the genus *Dolochorema* to subgeneric status within *Atopsyche*, thereby creating a third subgenus. A newly recognized species group and several additional species were left *incertae sedis* within Schmid's taxonomic outline.

It is possible to place the species described here within the existing taxonomic framework, based on the characters used to define the groups, and we have indicated these relationships below. However, in agreement with Schmid's critique of the existing taxonomic system, we have refrained from formally placing the newly described species within the current taxonomic hierarchy. Instead, we have limited ourselves to a discussion of characters shared by species. This discussion is not intended as a justification for the phylogenetic placement of the species; rather it is intended to provide information that may be of use in an eventual cladistic revision. Despite our reservations about the existing taxonomic system, it is undoubtedly true that a number of species currently placed together are closely related. This statement is based on the fact that some species share a number of ostensible character similarities, at least some of which are likely apomorphic. We discuss below character affinities of members of the Costa Rican fauna, and place the discussion within the contextual reference of the characters used by Ross and King (1952) to define species groups.

Setose glandular structures located on both terga III and IV of males is a character used by Ross (1953) to characterize a subgroup of species in the subgenus *Atopsyche*, including *A. implexa*, *A. banksi*, and *A. vatucra*. He placed this subgroup within his *kingi* group or complex, a new name designation for the *ikonnikovi* group of Ross and King (1952). Schmid (1989) merged the *kingi* group with the *bolivari* group of Ross and King (1952). One of our new species, *Atopsyche jaba*, has males with setose glands located on terga III and IV, and on this basis would be included within the subgroup of species recog-

nized by Ross. In addition to *A. jaba* and *A. implexa*, other species from Costa Rica that possess setose glands on both terga III and IV include *A. pachacamac* and *A. huainacapac*. *Atopsyche pachacamac* is similar to *A. jaba* and *A. implexa* in a number of respects, including overall coloration and the structure of the apex of the phallosome. However, *A. huainacapac* is distinctly different. It was placed by Schmid (1989) in the *longipennis* group of Ross and King (1952), and in the subgenus *Atopsaura*, indicating a very distant relationship to these other species. It is possible that the glandular character is homoplastic in this species, or perhaps the character is primitive and not phylogenetically informative. This is difficult to assess because the possession of glandular structures is not often mentioned in species descriptions, despite the fact that all of the species of *Atopsyche* from Costa Rica have glands present on sternum V and also on tergum III, or on both terga III and IV, with the sole exception of *A. chimpuoclo*, which lacks prominent glands on both terga III and IV. However, in none of the other species from Costa Rica are the glands internally setose. *Atopsyche dampfi*, *A. boneti*, and *A. cordoba*, are all structurally very similar to *A. jaba*, *A. implexa*, and *A. pachacamac*. However, in the descriptions of none of these species is the presence of setose glandular structures mentioned. In *A. dampfi*, which we had the opportunity to examine, glands are present on both segments, but are much reduced in size and lack setation. Clearly a phylogenetic analysis is required before these glandular structures, either by their morphology or by their presence or absence, can be confidently used to define groups.

Atopsyche minimajada is undoubtedly very closely related to *A. majada*, which was placed by Ross and King (1952) in the *batesi* group of *Atopsyche* and in the subgenus *Atopsaura* by Ross (1953). The defining character of this group is the possession of an unpaired dorsal spine emerging from the base of the phallosome. Species with this character, and in which the spine is bifurcate at the base and attached membranously to the phallosome, probably form a monophyletic assemblage, since the character is distinctive enough to make parallel evolution unlikely. The *batesi* group includes all of the species described from the Greater Antilles and also several additional species with distributions in Central America or the northern part of South America, extending as far south as Bolivia. *Atopsyche callosa* is the only additional species from Costa Rica included in this group.

The last new species described in this paper, *Atopsyche tapanti*, is very similar to *A. paucartampu* Schmid, and the two undoubtedly form a closely related species pair. Schmid (1989) placed *A. paucartampu* in the *tripunctata* group of Ross and King (1952). Other species from Costa Rica with a general similarity to these two species include *A. cira*, *A. talamanca*, and *A. chimpuoclo*. The latter species was placed by Schmid (1989) in the *bolivari* group of Ross and King. However, characters which *A. chimpuoclo* share with the other four species listed above include the possession of a mesally-directed, thumblike

protrusion on the first article of the inferior appendage at midlength (Fig. 3D) and elongate glandular structures associated with sternum V (Fig. 9). There is also a general color similarity between the species mentioned above; all have a rounded, blackish spot extending from the costal margin of the wing, bordered by golden setae. As mentioned above, *A. chimpuoclo* lacks noticeable glandular structures on either terga III or IV, whereas all of the other four species have rounded glandular structures without internal setation located on tergum III only. This last character is also found in the members of the *batesi* group found in Costa Rica (Fig. 8A), and is probably a plesiomorphic character.

Atopsyche erigia, also placed by Ross and King in the *tripunctata* group, is different in a number of respects from the other Costa Rican species placed in this group. The character used by Ross and King to define the group is the possession of a second article of the inferior appendage that is simple in structure and broad at the base. *Atopsyche erigia* was used as an archetypal example for the group. This character is rather superficial and species currently placed together on this basis may have only a spurious relationship. It seems likely that the *tripunctata* group is not a natural, or at least not a closely related assemblage of species. Unlike the other species from Costa Rica placed in the group, *A. erigia* has glandular structures on sternum V that are short, and rounded glandular structures without internal setation on both segments III and IV. Also, unlike the other species of the *tripunctata* group discussed above, the first article of the inferior appendage lacks a thumblike process on the mesal surface. On the other hand, in coloration *A. erigia* closely resembles *A. majada*, although it lacks the distinctive phallic spine that characterizes members of the *batesi* group. It is also now placed in a different subgenus. A close relationship of *A. erigia* to other species of the *tripunctata* group from Costa Rica is not well supported by character evidence. Hopefully, a cladistic analysis of the genus at some future date will sort out the seemingly contradictory character relationships existing among the species in the various subgenera and species groups.

ACKNOWLEDGMENTS

This research was supported by National Science Foundation grants BSR-8917684 and DEB 9400632, awarded to Ralph W. Holzenthal, and also by the University of Minnesota Undergraduate Research Opportunities Program and the College of Biological Sciences Honors Program at the University of Minnesota. A special thanks is due Ralph W. Holzenthal, who provided the illustrations of the wings of the new species and served as faculty advisor to the second author for the College of Biological Sciences Honors Program. The advice of Atilano Contreras, Victoria Nations, and Fernando Muñoz, as well as the editing of Susan Weller and Frank Barnwell were greatly appreciated. Paper number 22,541 Scientific Journal Series, Minnesota Agricultural Experiment Station, St. Paul, Minnesota.

LITERATURE CITED

- Botosaneanu, L. 1991. Trichoptères d'Haïti. Bulletin de L'Institut Royal des Sciences Naturelles de Belgique 61: 113-134.
- Denning, D. G. 1948. A Review of the Rhyacophilidae (Trichoptera). Can. Entomol. 80: 97-115.
- Denning, D. G. 1968. New and interesting North American Trichoptera. Pan-Pacific Entomol. 44: 17-26.
- Ross, H. H. 1947. Descriptions and records of North American Trichoptera, with synoptic notes. Trans. Amer. Entomol. Soc. 73: 125-168.
- Ross, H. H. 1953. Additional material on the phylogeny and dispersal of *Atopsyche* (Trichoptera: Rhyacophilidae). Journ. Wash. Acad. Sci. 43: 287-293.
- Ross, H. H., and King, E. W. 1952. Biogeographic and taxonomic studies in *Atopsyche* (Trichoptera, Rhyacophilidae). Ann. Entomol. Soc. Amer. 45: 177-204.
- Schmid, F.N. 1989. Les Hydrobiosides (Trichoptera, Annulipalpia). Bulletin de L'Institut Royal des Sciences Naturelles de Belgique 59 (supplement): 1-154.
- Sykora, J. L. 1991. New species of Hydrobiosidae from Ecuador (Insecta: Trichoptera: Annulipalpia). Ann. Carnegie Museum 60: 243-251.
- Wiggins, G. B. 1996. Larvae of the North American Caddisfly Genera (Trichoptera), Second Edition. Univ. Toronto Press, Toronto.

SCIENTIFIC NOTE

CHAMAEMYIDS AS PREDATORS OF *DIURAPHIS NOXIA* (HOMOPTERA: APHIDIDAE) IN KONYA PROVINCE, TURKEY¹

Meryem Elmali²

Three species in two genera of Chamaemyiidae (Diptera) have been found to be predators on *Diuraphis noxia* (Kurdjumov) colonies on wheat and other alternate host plants during four years (1989-1992) in Konya province, Turkey. *Leucopis* (*Leucopis*) *pallidolineata* Tanasijtshuk was previously reported from Turkey (Düzgünes *et al.* 1982) and as a predator of *D. noxia* (Tanasijtshuk 1984, Kovalev *et al.* 1991). *Leucopis* (*Leucopis*) *kerzhneri* Tanasijtshuk and *Parochthiphila* sp. are the first records in the world as predators of *D. noxia*. These two are also first records for Turkish fauna.

LITERATURE CITED

- Düzgünes, Z., S. Toros, N. Kiliñçer, and B. Kovanci. 1982. Ankara ilinde saptanan afit predatörü *Leucopis* türleri (Dip.: Chamaemyiidae). Turk. Bit. Kor. Derg., 6: 91-96.
- Kovalev, O.V., T.J. Poprawski, A.V. Stekolshchikov, A.B. Vereshchagina, and S.A. Gandrabur. 1991. *Diuraphis* Aizenberg (Hom., Aphididae): key to apterous viviparous females and review of Russian language literature on the natural history of *Diuraphis noxia* (Kurdjumov, 1913). J. Appl. Entomol. 112: 425-436.
- Tanasijtshuk, V.V. 1986. [Silver flies (Chamaemyiidae)]. Keys to the fauna of the USSR. Diptera 14 (7). Leningrad: Nauka.

¹ Received September 16, 1996. Accepted December 10, 1996.

² Plant Protection Department, Faculty of Agriculture, Selçuk University, 42031 Konya, Turkey.